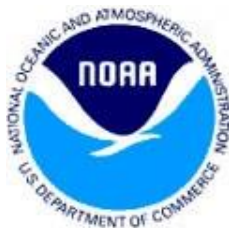# USMCC Data Distribution

SAR Controllers Workshop 2020
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ERT, Inc.

MCC Processing

- The current operational system includes LEOSAR/GEOSAR/MEOSAR data (LGM system)
  - LGM early operations began December 2016
- These MCCs automatically deliver MEOSAR data and follow C/S data distribution rules for LGM MCCs as of 01 March 2020
  - 4 nodal MCCs: USA, France, Spain and Australia (Japan coming soon)
  - 4 non-nodal MCCs: Norway, United Kingdom, Qatar and Cyprus
- LEOSAR/GEOSAR only (L/G) MCCs do <u>not</u> distribute MEOSAR data <u>automatically</u>
  - L/G MCCs must send MEOSAR data to their associated RCCs and SPOCs <u>manually</u>.
- International Data distribution procedures are described in C/S A.001, the COSPAS-SARSAT Data Distribution Plan (DDP)
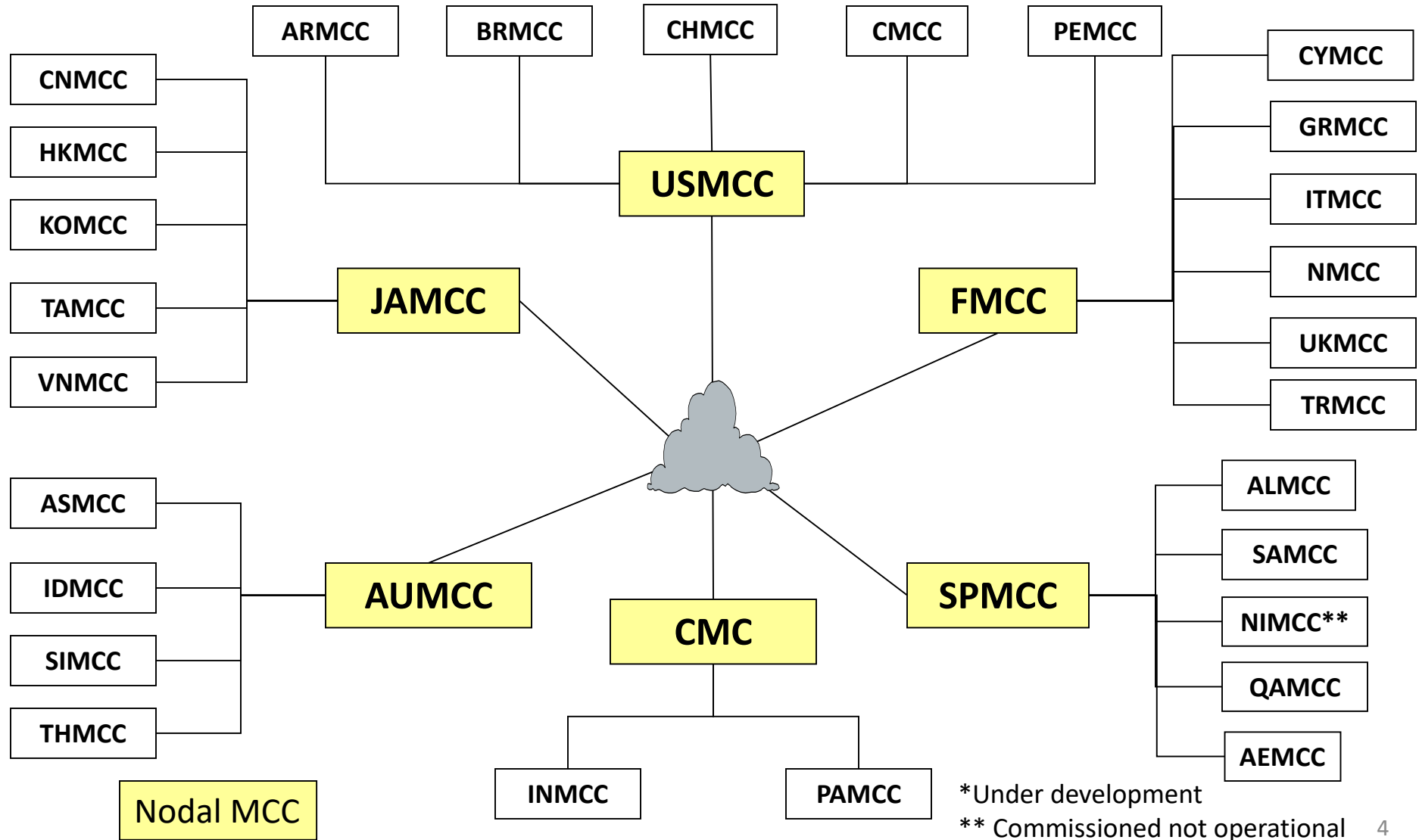 - In addition, the USMCC follows national data distribution procedures

MCC to MCC Data Distribution
Nodal Distribution Network

- The USMCC is nodal for the Western Data Distribution Region
- Messages are sent between MCCs via a <u>nodal</u> system
- There are 6 nodal MCCs in the C/S System
  - The nodal MCC distributes messages to all MCCs in its DDR and to all other nodal MCCs
  - Non-nodal MCCs only distribute messages to the nodal MCC in its DDR
- Advantages of the nodal system:
  - 32 MCCs in C/S system as of February 2020
  - MCCs are not required to establish and maintain communication links with all MCCs
  - Enables nodal MCCs to perform monitoring for all MCCs in its DDR
  - MCC backups are simpler to implement (e.g., when the CMCC is down, only the USMCC needs to change its data distribution)

MCC to MCC Data Distribution
Nodal Distribution Network

ARMCC — BRMCC — CHMCC — CMCC — PEMCC

CNMCC — HKMCC — KOMCC — TAMCC — VNMCC — **JAMCC**

USMCC

FMCC — CYMCC — GRMCC — ITMCC — NMCC — UKMCC — TRMCC

ASMCC — IDMCC — SIMCC — THMCC — **AUMCC**

CMC

SPMCC — ALMCC — SAMCC — NIMCC** — QAMCC — AEMCC

INMCC — PAMCC

Nodal MCC

*Under development
** Commissioned not operational

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Overview: Ground Station Satellite Data

- MEOLUTs send 1 position using multiple MEOSAR satellites
  - A single Difference of Arrival (DOA) position computed by MEOLUT
  - DOA position computed using differences in Time of Arrival (TOA) and/or Frequency of Arrival (FOA) data from multiple MEOSAR satellites
  - No inherent ambiguity
  - Encoded position may be sent in beacon message
- LEOLUTs send 2 positions using 1 LEOSAR satellite
  - Doppler A/B positions
  - 1 real position and 1 image position
  - Inherent ambiguity
  - Encoded position may be sent in beacon message
- GEOLUTs send beacon detections for 1 GEOSAR satellite
  - No independent position
  - Encoded position may be sent in beacon message

Basic Alert Distribution Rules

- Each beacon event (detect time/satellite/beacon) is only sent once (redundant data is filtered)
- **Unlocated** alerts are distributed
  - Internationally based on beacon country code
  - Nationally based on beacon registration data (if available)
- Notification of Country of Registry (NOCR) messages are distributed based on country code
  - Sent when the alert is located outside the SRR of country of registration
- Ship security (SSAS) alerts are distributed to the SSAS competent authority based solely on country code
  - For USA country codes, alerts are sent to LANTAREA and PACAREA
- Located alerts are usually distributed based on location (C/S GEOSORT for world, USMCC GEOSORT for USMCC service area)

Unlocated Alerts

- Per C/S MCCs, distribute based on country code of beacon
- For beacon IDs with a US country code (303, 338, 358, 366, 367, 368, 369, 379, 536, or 559)
  - If the beacon is registered in the US 406 MHz RGDB
    - Alert is distributed based on **SRR in registration**
    - SRR in registration is based on
      - State or country of homeport, or
      - State or country of owner's mailing address
    - If no SRR is assigned (and vessel or aircraft ID is encoded in the beacon ID), alert is distributed based on beacon type
      - EPIRB alerts to PACAREA
      - ELT alerts to AFRCC
      - PLB alerts to AFRCC

Unlocated Alerts – Alternate Registry

- <u>Craft ID</u> decoded from the 406 MHz beacon message (15-hex ID) and provided on the RCC alert message can be used to access other registration databases:
  - EPIRBs: Radio Call Sign, Ship Station ID, etc.
    - RCC must look up using ITU or other source
    - Unlocated EPIRB alerts sent to PACAREA
  - ELTs: 24-bit address, aircraft operator designator, etc.
    - RCC must look up using tail number database
    - Unlocated ELT alerts sent to AFRCC
- If no vessel or aircraft ID (i.e., no link to another registry) in beacon message, the unlocated alert is <u>not</u> distributed to a US RCC or SPOC

Unlocated Alerts – Non-USA-Coded Beacons

- Unlocated alerts for a <u>non-USA-coded</u> beacon within the US Search and Rescue Region (SRR) are distributed based on country code:
  - To the country's SPOC if the USMCC communicates directly with the SPOC
    - Example: Colombian beacon goes to Colombia
  - Otherwise, to the US RCC in whose SRR the country is included
    - Example: Cuban beacon goes to CGD07

Unlocated Alerts – SRRs for US Registered

RGDB SRR Assignments – Non-US Areas

State Abbreviation	State Name	EPIRB SRR 01	EPIRB SRR 02	ELT SRR	PLB SRR 01
AN	Antigua	San Juan		AFRCC	AFRCC
BH	Bahamas	CGD7		AFRCC	AFRCC
BL	Belize	CGD7		AFRCC	AFRCC
BR	Bermuda	CGD5		AFRCC	AFRCC
CI	Cayman Islands	CGD7		AFRCC	AFRCC
CR	Costa Rica	PacArea		AFRCC	AFRCC
DR	Dominican Republic	San Juan		San Juan	San Juan
ES	El Salvador	PacArea		AFRCC	AFRCC
GT	Guatemala	PacArea		AFRCC	AFRCC
HN	Honduras	CGD7		AFRCC	AFRCC
JA	Jamaica	CGD7		AFRCC	AFRCC
MR	Marshall Islands	CGD14	`	CGD14	CGD14
NA	Netherlands Antilles	San Juan		San Juan	San Juan
NI	Nicaragua	CGD7		AFRCC	AFRCC
PR	Puerto Rico	San Juan		San Juan	San Juan
RP	Panama	CGD7		AFRCC	AFRCC
SV	Saint Vincent	San Juan		San Juan	San Juan
VI	Virgin Islands	San Juan		San Juan	San Juan

NOCR Distribution

- Per C/S, alert message sent based on country code and beacon location
  - Sent when the alert is located outside the SRR of country of registration
- The USMCC distributes an NOCR to a US RCC when it first receives a located alert for the alert site, and
  - The alert is for a US-coded beacon but not in a US SRR, or
  - The alert is for a non-US-coded beacon for a country supported by a US RCC (e.g., Bahamas), but not in that country's SRR
  - Allows US RCC to ensure that there is a SAR response for (US) beacon
- Caution: If NOCR from a MEO alert and the beacon location is serviced by a LEOSAR/GEOSAR only MCC, the alert may not be sent to the responsible RCC!
- The USMCC:
  - Continues to send alerts to NOCR destinations until position is confirmed
  - Sends an NOCR indicating that position is confirmed, if position is confirmed on the first located alert
  - Will not send an NOCR if it previously sent an alert message with location to a RCC for the site

Unlocated and NOCR Distribution – Non-USA Country Codes

Country Code	Associated RCC/SPOC
MID: 307 ARUBA	NANTSP
MID: 308/309/311 BAHAMAS	CGD7
MID: 314 BARBADOS	SANJN (CG Sector San Juan)
MID: 310 BERMUDA	BERMUDASP
MID: 378 GB VIRGIN ISLANDS	SANJN (CG Sector San Juan)
MID: 319 CAYMAN ISLANDS	CGD7
MID: 730 COLOMBIA	COLMSP
MID: 323 CUBA	CGD7
MID: 327 DOMINICAN REPUBLIC	DOMREPSP
MID: 330 GRENADA	SANJN (CG Sector San Juan)
MID: 750 GUYANA	GUYSP
MID: 336 HAITI	HaitiSP
MID: 339 JAMAICA	CGD7
MID: 538 MARSHALL ISLANDS	CGD14
MID: 510 MICRONESIA	MARSEC (CG Sector Guam)
MID: 306 NETHERLANDS ANTILLES	NANTSP
MID: 511 PALAU	MARSEC (CG Sector Guam)
MID: 351/352/353/354/355/356 PANAMA	PanSP
MID: 357/370/371/372/373/374 PANAMA	PanSP
MID: 375/376/377 SAINT VINCENT & GRENADINES	SANJN (CG Sector San Juan)
MID: 362 TRINIDAD AND TOBAGO	TTSP
MID: 364 TURKS AND CAICOS ISLANDS	CGD7
MID: 775 VENEZUELA	VZMCC

SSAS Beacons and
Alerts for Unreliable Beacon IDs

- Alerts for USA-coded Ship Security Alert System (SSAS) beacons
  - Distributed to LANTAREA and PACAREA
  - After a SSAS beacon is detected, LANTAREA/PACAREA may request alerts be sent to other RCC(s)

- Alerts for unreliable beacon IDs:
  - 406 MHz beacon message failed validation checks due to
    - Malfunctioning beacon or miscoded beacon
    - LUT or satellite processing
  - When 406 MHz beacon message fails validation checks:
    - <u>All</u> encoded data is considered unreliable, therefore unlocated alerts are not distributed because unlocated alerts are distributed based on the country code in the beacon message
    - **Alerts are only distributed based on DOA or Doppler location**
    - If in US SRR, also sent to USCG LANTAREA and PACAREA (may be SSAS)

MEOSAR Uncorroborated Alerts

MEOSAR uncorroborated alerts are alerts based on a single beacon burst detected by one satellite, with no other detection for beacon

- Uncorroborated alerts may later be corroborated by another detection for the beacon (LEO, GEO, or MEO)

- Uncorroborated alerts never corroborated by another beacon detection have been used in SARSAT rescues (3 cases in 2017)

- Per C/S requirements, uncorroborated MEOSAR alerts are:
  - Distributed to LGM MCCs
  - Not distributed to LEOSAR/GEOSAR (L/G) only MCCs
  - Distributed to national RCCs as determined nationally
  - Distributed to SPOCs if the beacon is known to be registered or the source LUT is commissioned for low processing anomaly rate

Located Alerts/Detection Updates

Located alerts are usually distributed based on location (C/S GEOSORT for world, USMCC GEOSORT for USMCC service area)

- Detection update sent when 30 minutes has passed since the previous alert for beacon or MEOSAR uncorroborated alert is corroborated (USMCC rule only)

- A new MEOSAR alert is expected (per C/S rules):

  – Within 5 minutes before position confirmation*

  – Within 15 minutes after position confirmation*

*Based on latest data time of new vs. most recent data time of sent DOA alerts
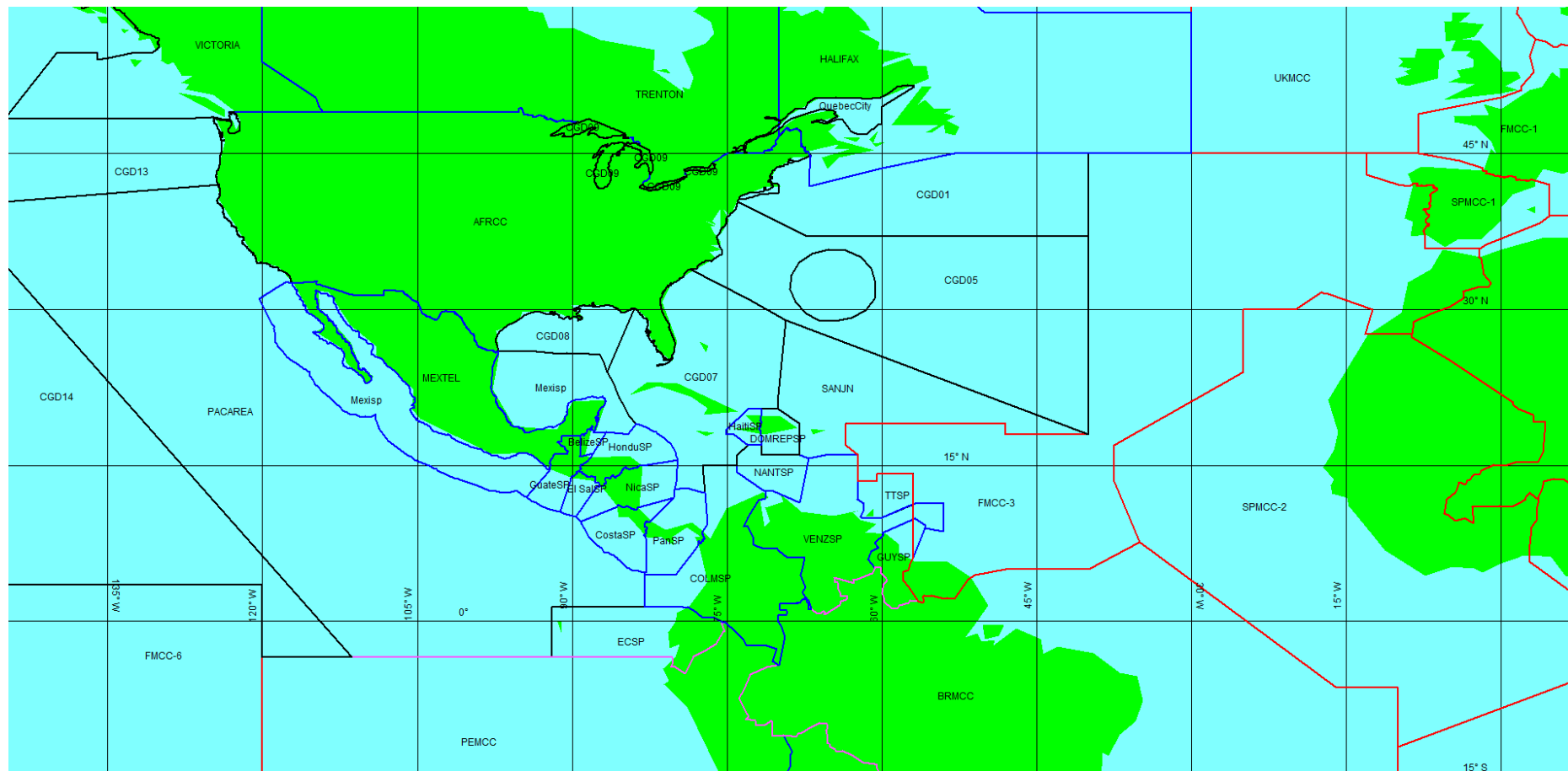
Located Alerts

The USMCC

- Distributes alerts to US RCCs within 50 km buffer zone

- Distributes alerts to US RCCs within 348 km buffer zone for some US SPOCs, based on the 200 nautical mile US Exclusive Economic Zone (EEZ)

- Sends same pass update, prior to position confirmation, if the "A" side probability increases by at least 15%

- Sends located and unlocated alerts for US special program beacons specially (i.e., in append or replace mode)

Located Alerts

New alert with DOA or Doppler location distributed when:

- DOA or Doppler location first received
- Subsequent DOA location has improved Expected Horizontal Error (EE):
  – Less than 150 NM (277.8 km) <u>and</u>
  – At least 2 NM (3.7 km) less than lowest previously sent DOA expected error <u>and</u>
  – At least 50% less than lowest previously sent DOA expected error
- Before position confirmation, DOA position update every 5 minutes*
- Before position confirmation, position conflict occurs (20 km threshold)
- Position confirmation is achieved; for 2 DOA positions this requires:
  – Each DOA alert to include data from one satellite not included on the other alert and time separation of at least 2 seconds in some portion of the periods for the two alerts (i.e., separate bursts); <u>or</u>
  – At least 30-minute time separation for the two DOA alerts
  – Position can also be confirmed by DOA, with Doppler or encoded position
- After position confirmation, DOA position update every 15 minutes*
- After position confirmation, DOA position conflict as often as every 10 minutes*

*Based on latest data time of new vs. most recent data time of sent DOA alerts

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Position Confirmation

- Position confirmation requires independent positions that match within <u>20 km</u>

- Matching positions can come from:
  - Independent Doppler positions
  - Independent DOA positions
  - A Doppler and DOA position
  - A Doppler and encoded position
  - A DOA and encoded position

- Position confirmation alert sent to all previous alert recipients for beacon activation

- By default, messages are sent after position confirmation to the destination associated with the real position (MCC per C/S rules; US RCC or SPOC if location within USMCC service area)

Alert Site Closure

- Sites close automatically
  - 2 hours without a detection, if the beacon was detected by a USA MEOLUT with DOA position or a USA GEOLUT, or
  - 6 hours without a detection; otherwise,
  - 72 hours since alert site opened (regardless of time since last detection)
- Sites close manually
  - USMCC Controller closes site at RCC request
- <u>IHDB record created waiting for RCC or SPOC input</u>
  - RCC updates IHDB directly
  - SPOC provides Incident Feedback from USMCC site closure message to USMCC for entry by USMCC personnel

Conclusion

Questions?